METHOD OF MAKING FIN STIFFENERS FOR ENGINE CYLINDERS

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1 Claim. (Cl. 18—59)

This invention relates to a fin stiffener or damping device, and more particularly to a device to be applied to the cooling fins of an internal combustion engine, for example, to prevent vibration of these fins when the engine is in use.

The engine cylinders of internal combustion engines and particularly airplane engines, which are air cooled, are usually provided with a series of spaced fins or thin plates which project outwardly from the cylinder in spaced relation. During the flight of an airplane provided with an engine the cylinders of which have cooling fins of this character, the fins are set into vibration and spacers have been used between the fins to prevent or damp these vibrations. In some instances it has been the practice to employ a strip of uncured rubber, usually synthetic rubber, which has been applied to the fins externally and then pushed toward the engine cylinders so that the fins bite in to the soft uncured rubber, thus providing that portions of the latter enter the spaces between the fins and hold them apart. The strip of rubber is subsequently cured by heat treatment later given to the cylinder.

In the practice of the method described above it is proposed to push the strip only part way into the spaces between the cylinders, thus leaving a connecting strip of material on the outside of the fins which would connect together the portions of the strip which extend between the fins. However, as uncured rubber is quite soft, it is difficult to push the material into the fins a uniform and proper distance. When pushed in too far the portion of the strip on the outside of the fins would be too thin and break off, and as a result the part between the fins would fall out and thus permit vibration. When the strip was not forced in between the fins a sufficient distance, it would often not stay in place and, in any event, would be uneven on its external surface.

It is contemplated by the present invention to provide a strip of material for this purpose which will have a relatively soft body which may be pushed in between the fins on an engine cylinder, but which will have a relatively hard or tough coating or skin so that the body portion will enter the spaces between the fins readily, but the insertion will be limited by the contact of the fins with the harder or tougher outside skin. It has been found that a very satisfactory strip of material of this kind may be provided by employing a body portion of uncured rubber, preferably synthetic, such as one of the silicone rubbers for example, while using for the outside layer, or skin, a layer of cured rubber. The two parts of this strip are secured together so as to form a substantially integral structure. When applied to the fins of the engine cylinder with pressure on the outer cured layer, the fins will cut into the soft uncured inner body portion and parts of the latter enter the spaces between the fins where these parts will fit snugly to restrain the fins from vibration. The amount of insertion of the soft body portion will, of course, be limited by the contact of the peripheral edge of the fins with the tougher cured layer of rubber at the outside of the damping strip. The uncured portion of the strip will later be cured by treatment given to the cylinder.

One object of the invention is to provide a stiffening or damping device for the fins of a cylinder of an internal combustion engine.

Another object of the invention is to provide an element of this character comprising a strip of material having a relatively soft body portion to be applied to the fins of the cylinder and pushed between the fins, and a relatively tough outer layer or skin which the fins will not penetrate so as to limit the insertion of the parts of the strip between the fins.

A still further object of the invention is to provide a device of this character which will be constructed of an outside layer or skin of relatively tough material such as cured rubber, and an inner body portion consisting of uncured rubber, the latter preferably being substantially triangular in shape.

To these and other ends the invention consists in the novel features and combinations of parts to be hereinafter described and claimed.

In the accompanying drawings:

Fig. 1 is a fragmentary side elevational view of the cylinder of an internal combustion engine having cooling fins with the improved damping device applied thereto;

Fig. 2 is a horizontal sectional view taken between two adjacent fins on line 2—2 of Fig. 1;

Fig. 3 is a longitudinal sectional view through one of the damping strips on line 3—3 of Fig. 1; and

Fig. 4 is a perspective view of a portion of one of the damping strips before it is applied to the engine cylinder.

To illustrate a preferred embodiment of my invention, I have shown in the drawings a portion of an engine cylinder provided with a plurality of cooling fins. These fins as shown are in the form of relatively thin plates which lie in planes which extend transversely of the axis of the engine cylinder and are disposed in spaced relation
so as to permit circulation of air therebetween. As these fins are relatively thin and as they extend outwardly from the engine cylinder for some distance in order to provide sufficient surface for cooling purposes, they are subjected objectionably to vibration particularly when used upon an airplane engine, for example. The device of the present invention is designed to effectively prevent such vibration, and is so constructed that it will be durable and remain in place.

In Fig. 4 of the drawings, I have shown the improved damping strip as it appears prior to its application to the fins of the engine cylinder. This strip comprises an outer skin or layer 12 of cured rubber and an inner body portion 13 of uncured rubber. While the dimensions of the device may be varied as desired, it has been found expedient for the outer layer 12 to be approximately one-sixteenth of an inch thick by three-eighths of an inch wide. This is superposed upon and caused to adhere to the body portion 13 of uncured rubber which is of substantially triangular shape in cross-section, having a base approximately three-eighths of an inch wide or a dimension equal to the width of the strip 12, while the altitude or thickness of the portion 13 is substantially three-sixteenths of an inch.

It will be understood that, as shown in Fig. 4, the body portion 13 of the damping member is continuous throughout its length, as is also the outer layer 12. When the element is applied to the outer edges of the fins and adjusted inwardly, these thin edges will cut through the relatively soft uncured rubber of the element 13 so that, as shown in Fig. 3, separate spacing fingers or lugs 14 will extend inwardly between the fins 11. While the fins will cut through the uncured rubber readily, they will meet resistance when the outer cured relatively tough layer 12 is reached. This will limit the insertion of the stiffening members between the fins so that they will project an even and uniform distance into the spaces between the fins. At the same time, the smooth strip 12 will remain exteriorly of the fins to provide a uniform thickness of material over the edges of the fins and connect together the fingers 14 so that the latter will be held in place. It will be understood that the uncured rubber in the members 14 will later be cured by the treatment given the engine cylinder so that they will be relatively firm and durable and render satisfactory service, and will be integrally united with the outer layer or strip 12 to form a homogeneous structure.

The portion 13 of uncured rubber or rubber-like material is inherently tacky and when applied to the untreated surface of the cured strip 12 will adhere thereto without the use of cement or other bonding material. Thus, there will be nothing between the two rubber strips to interfere with an integral union of the two parts of the damping member when the cured portion is used directly upon the engine cylinder.

It will be understood that such an element as shown in Fig. 4 consisting of a portion of uncured rubber and an outer strip of cured rubber or similar material also has other uses than that described above. It may, for example, be used as a vibration damper in other relations, such as electric tapes, and for seals, such as crack seals for ovens or the like, glass seals, pipe lines, or collar.

While I have shown and described a preferred embodiment of my invention, it will be understood that it is not to be limited to all of the details shown, but is capable of modification and variation within the spirit of the invention and within the scope of the claim.

What I claim:
A method of providing a vibration-damping structure upon a body having a plurality of parallel cooling fins projecting outwardly therefrom, which comprises providing a composite strip having an outer part of flexible and relatively hard, cured, rubber compound not readily penetrable by the edges of the cooling fins, and an inner part constituted by a continuous layer of relatively soft, uncured, rubber compound adhering to said outer part, said uncured rubber compound being readily penetrable by the edges of the fins and moving the strip laterally and perpendicularly against the edges of the fins so that the fins cut into the uncured compound and separate it into different portions disposed and compressed between the fins, and continuing the movement until the relatively hard part of the strip contacts the fin edges and resists further movement, whereby the relatively soft compound is extended fully into the spaces between the fins, and thereafter curing the uncured compound on the body by the application of heat and thereby integrally uniting the two parts of the strip.

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